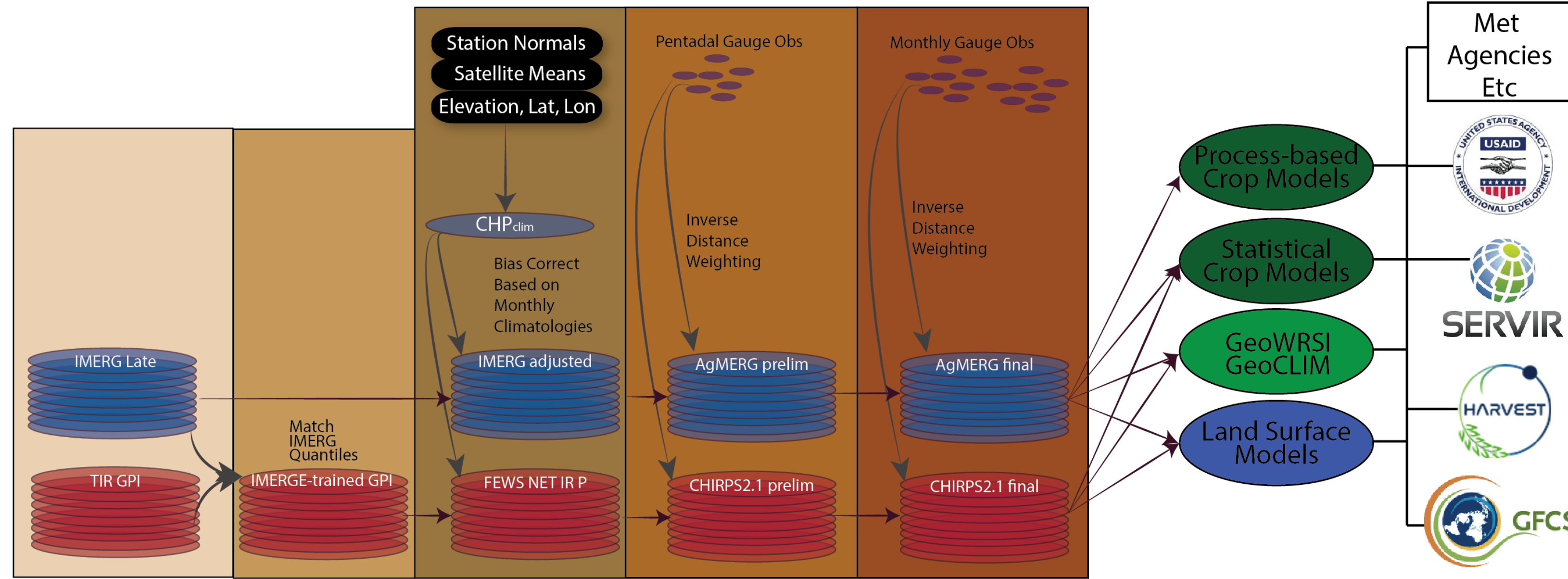


Ag Out – An Enhanced IMERG-based Agricultural Outlook System to Support Food Security and Agriculture in the Developing World

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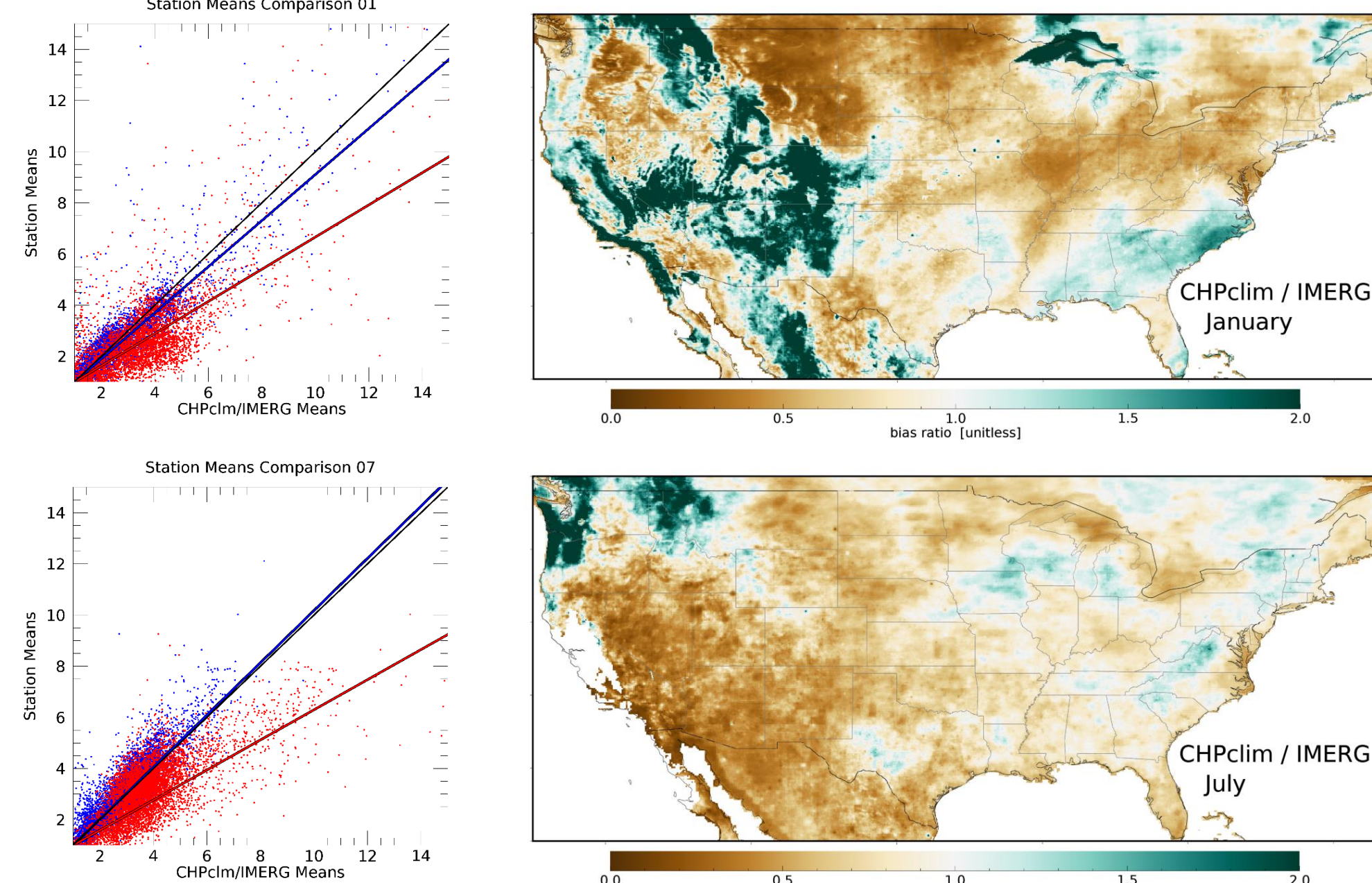
1. Overview

This project will develop a bias-corrected station enhanced AGMERG product designed to support global agricultural monitoring. Based on IMERG late.



2. The first step involves analysis of systematic bias

Preliminary algorithm development and testing has focused on CONUS and northern Mexico (the area covered by NLDAS). This focus area was inspired by analysis by Danie Sarmiento, Amy McNally and Kim Slinksi (NASA GSFC).

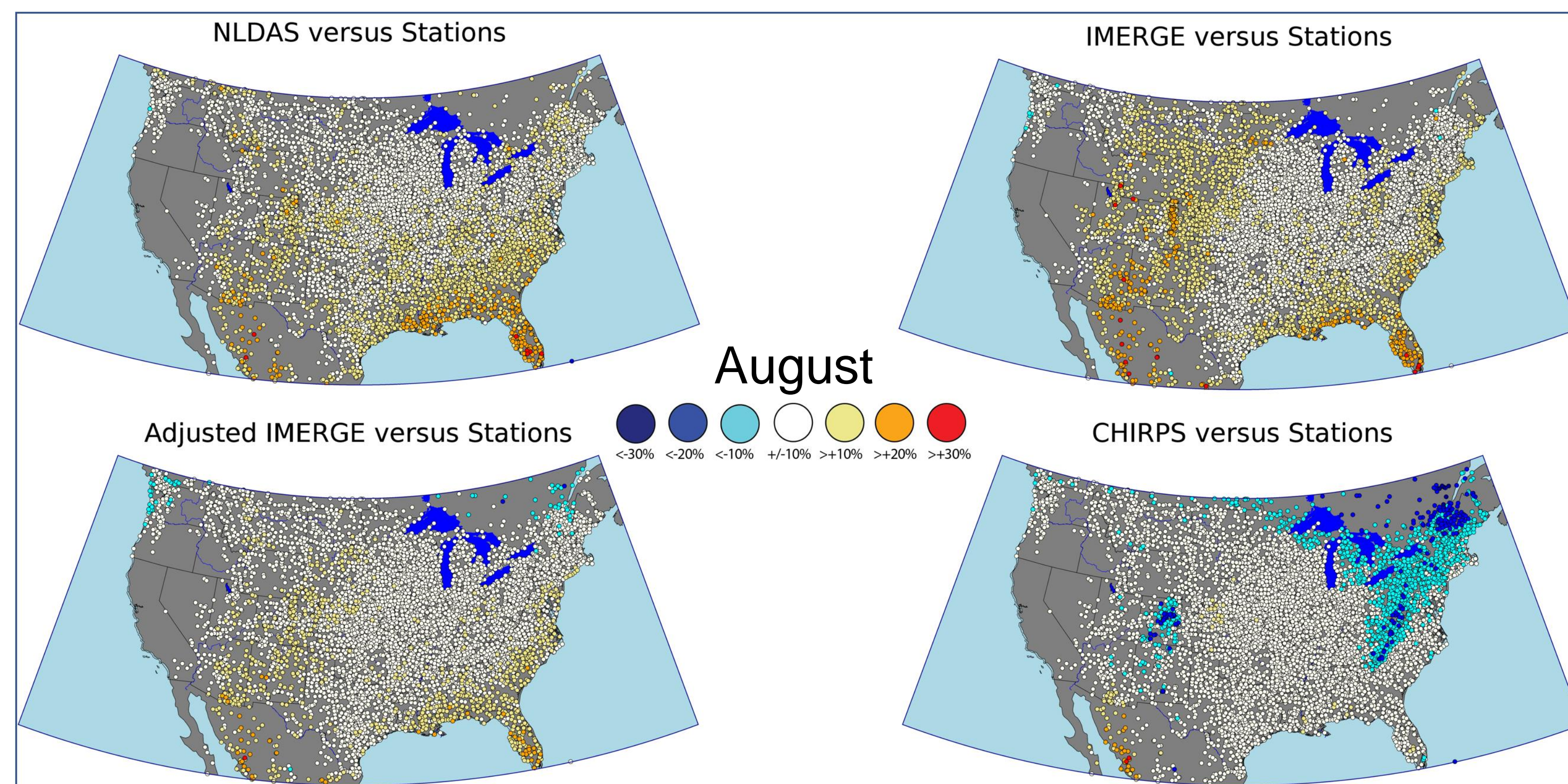


Comparisons with IMERG long term monthly averages and >5K GHCN/CONAGUA station normal indicate substantial bias in the IMERG.

Right hand panels display bias ratios based on comparison with the CHPclim climatology.

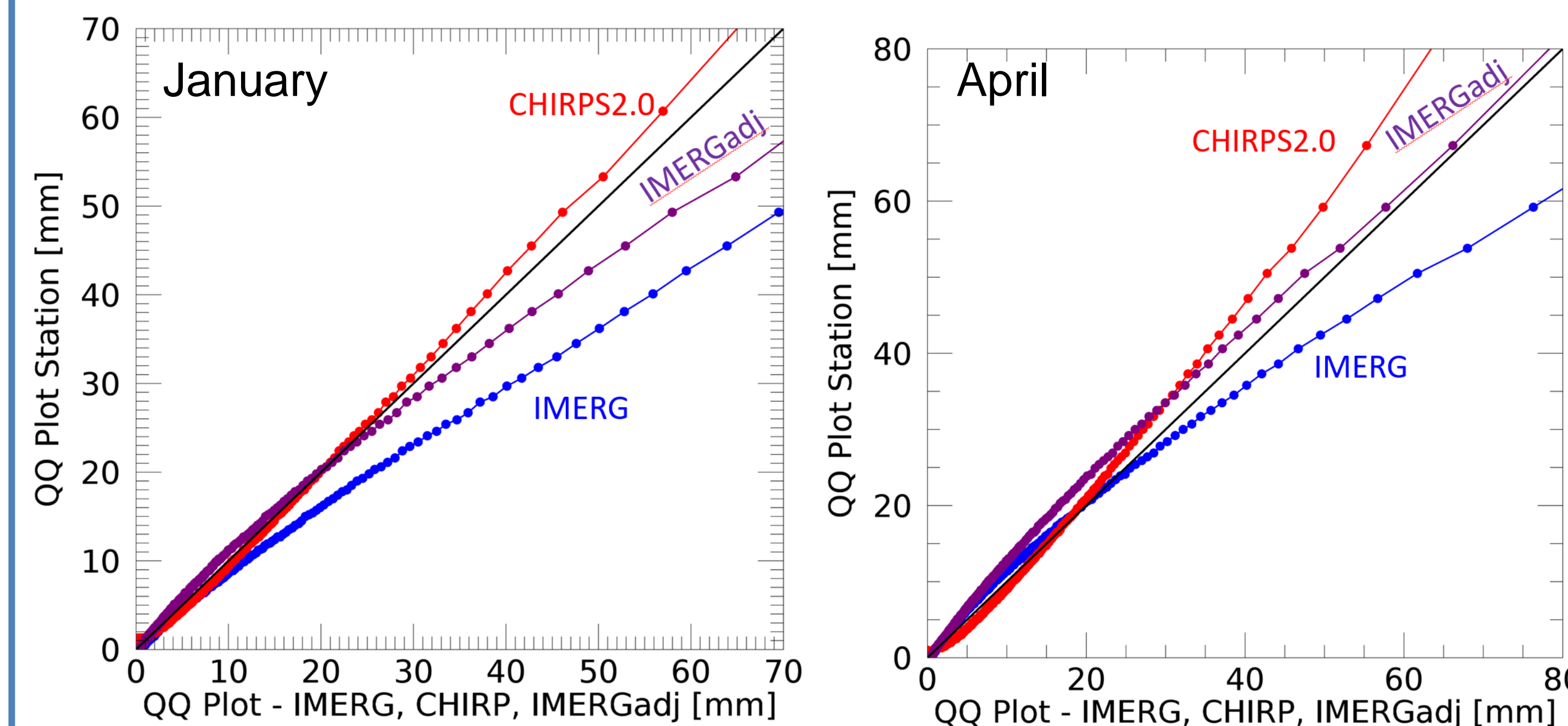
3. Unbiasing and Frequency of Dry Day Analyses

An evaluation of IMERG dry day (daily precipitation < 1 mm) frequency and hit rates indicated good performance. A bias corrected version of the IMERG late product (IMERGadj) was therefore created by scaling each month's IMERGlate value by the local ratio between CHPclim and the IMERG Late estimates. We refer to this as 'nudging'.



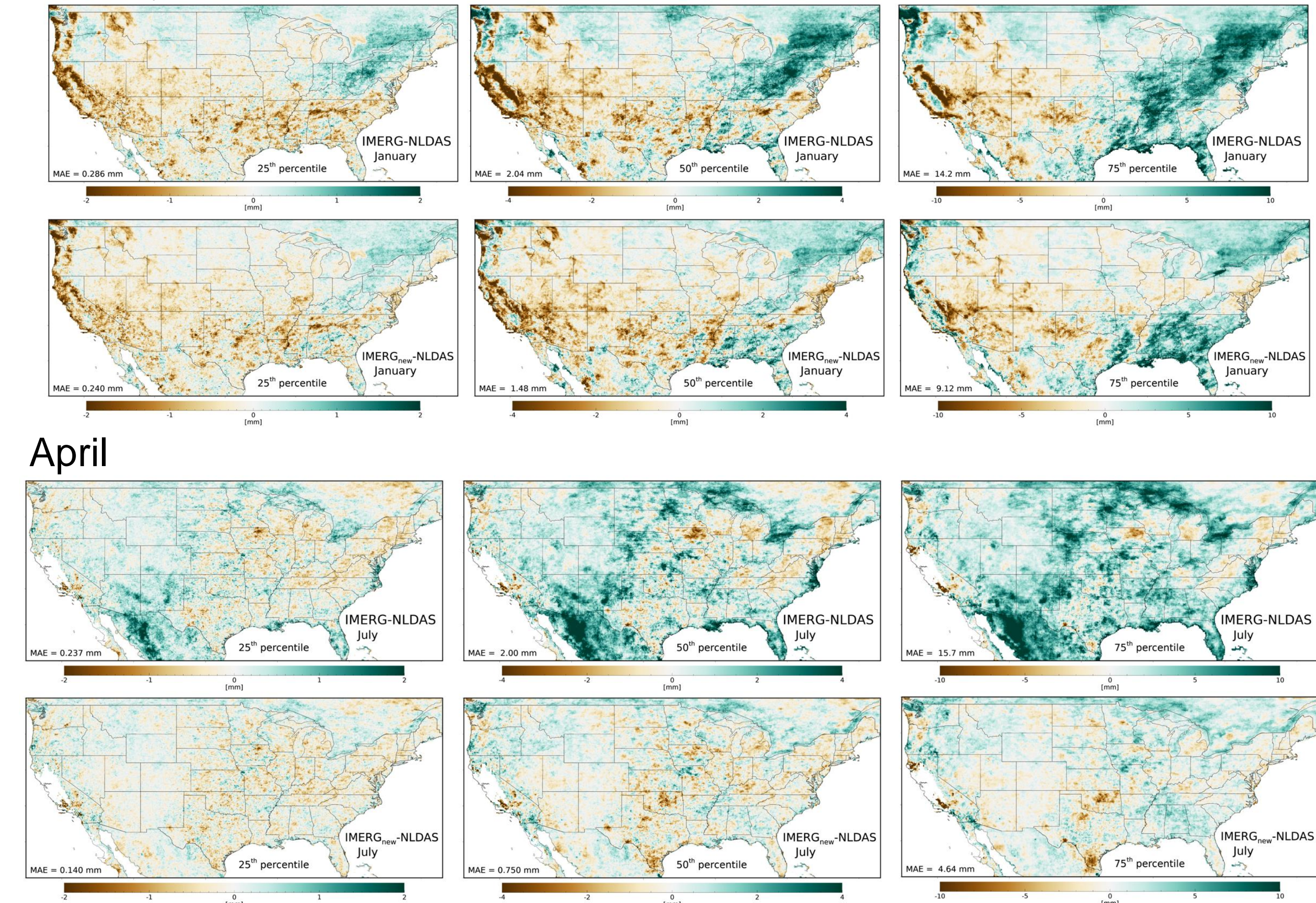
These panels show the difference the in the percent of dry days (station minus gridded estimate) for August for the NLDAS, IMERG, IMERGadj, and CHIRPS.

4. Examining monthly CONUS QQ plots



Monthly Station-IMERG QQ-plots suggested good performance and fairly linear relationships to observed station quantile values. In general (but not for every location and month), the adjusted IMERG estimates tended to align better with station quantiles.

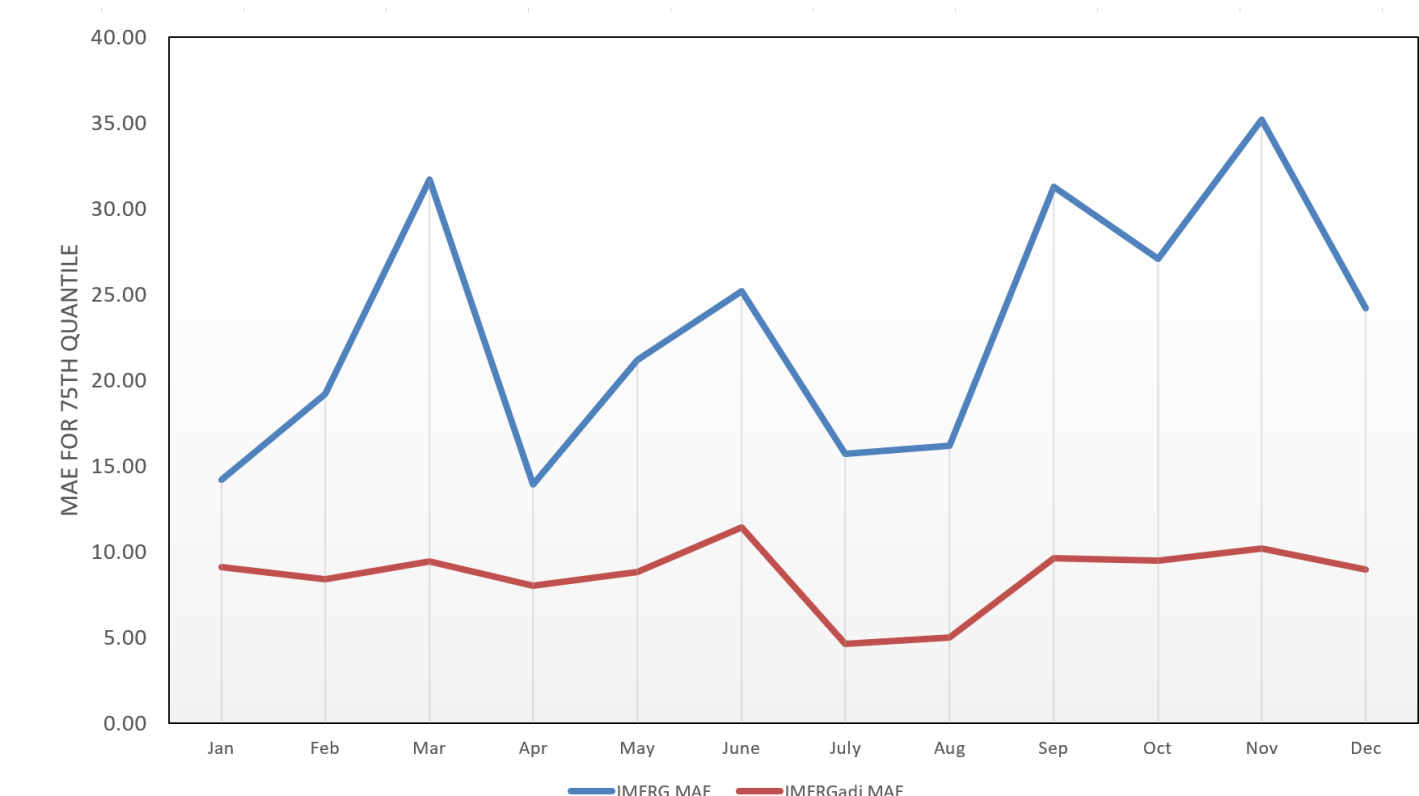
5. Comparing IMERG/IMERGadj and NLDAS quantiles



For January and April, the top row of panels shows the mean difference between IMERG and NLDAS 25th, 50th, and 75th quantile average rainy day precipitation. The bottom rows show the same calculations based on the IMERGadj product.

6. 75th Quantile MAE

The time series shows month-by-month mean average errors (differences) between on 75th percentile NLDAS and IMERG precipitation at each location. Quantiles based only on days with precipitation > 1 mm.

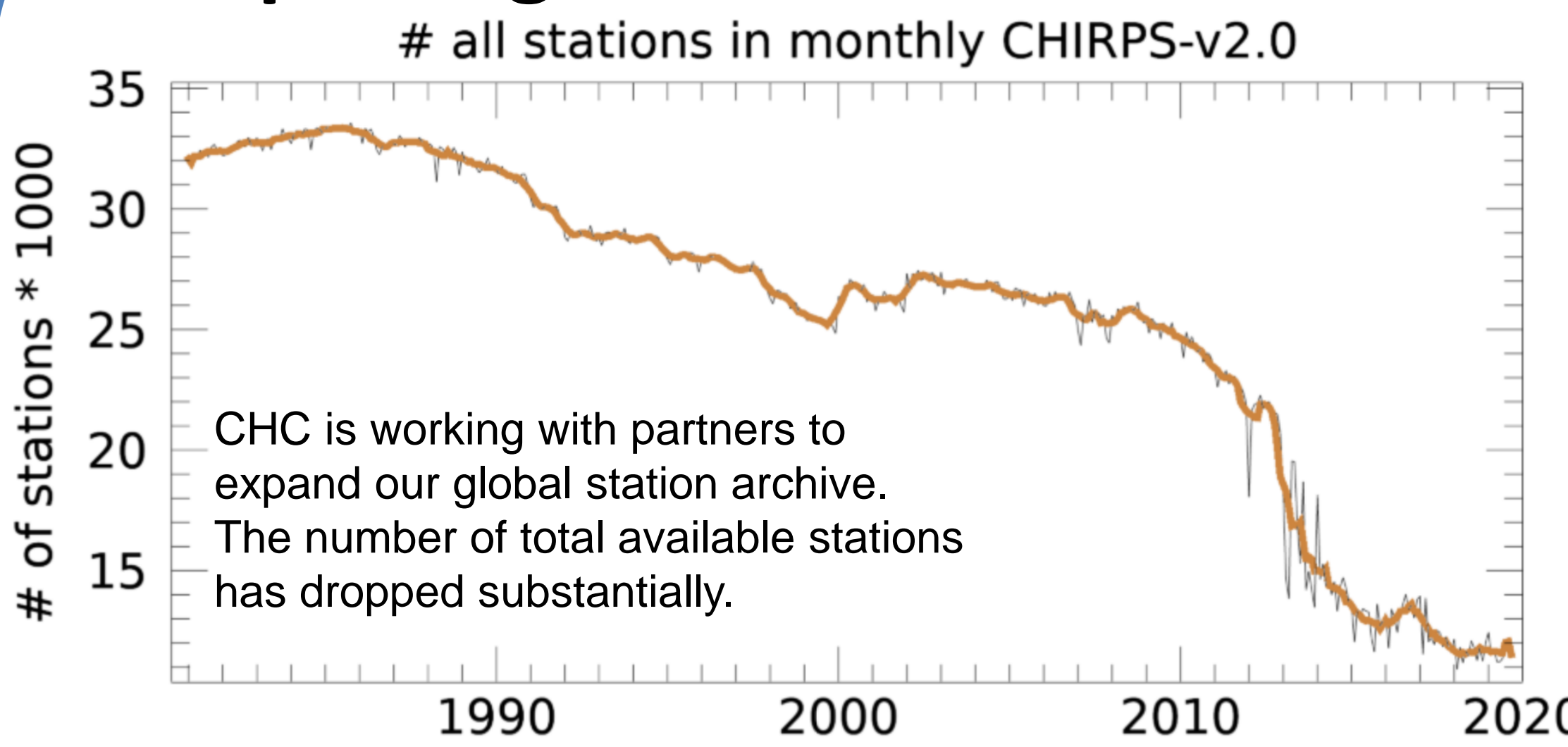


7. Plans for Climate Hazards center Precipitation climatology version 2

- All climate normals are gauge corrected.
- Starts with 30k locations used in current CHIRPS.
- Adds another 1200+ from new sources.
- Adds in 43k GPCC values 10km away from existing.
- Finishes with 5.5k FAO values.
- Total ~80k climate normal.

The CHPclim v2 will be produced using a new adaptive Moving Window Regression procedure (in R) with CHPclim v1 as a background.

8. Reporting Crisis and New Data Sources



Historic Sources			Sources in progress		
Source	# stations	location	Source	# stations	location
El Salvador	25	El Salvador	Cambodia	51	Cambodia
INTER	20	Nicaragua	Myanmar	36	Myanmar
Iran	10	Iran	Nepal	130	Nepal
SWALIM	64	Somalia	Sri Lanka	94	Sri Lanka
Nicholson-3	1,020	23 countries Africa	Vietnam	166	Vietnam
Adoum	105	Niger and Chad	Togo	9	Togo
Panama	103	Panama	Ghana	22	Ghana
Bangladesh	35	Bangladesh	Nigeria	40	Nigeria
Guatemala	45	Guatemala	ICAFE	32	Costa Rica
Sudan	28	Sudan	Honduras	26	Honduras
Haiti	11	Haiti	Uganda	14	Uganda
Thailand	119	Thailand			

Sources that update monthly		
Source	# stations 2019.09	location
GHCN -v2	887	Global
GHCD-daily	8,019	Global
fgTS	4,084	Global
fgSOD	4,700	Global
IDEAM	529	Colombia
Conagua	691	Mexico
SASSCAL	77	Southern Africa
INSIVUMEH	91	Guatemala
Ethiopia NMA	112	Ethiopia
ETESA	14	Panama
SWALIM	64	Somalia
SISMAT	3	Haiti

9. Future plans

- Implement and test IMERGadj algorithm globally
- Complete station ingest and quality control
- Create and validate a new version of the CHPclim climatology
- Produce operational pentadal (prelim) and monthly (final) AGMERG processing stream
- Validate and document IMERG product
- Explore applications to agricultural modeling with Earth Institute/NASA GISS partners